A Note On
Astronomer R. G. Chandra and British Astronomical Association

Sudhindra Nath Biswas[1], Utpal Mukhopadhyay[2] & Saibal Ray[3]

[1]*Mahatma Aswini Kumar Dutta Road, Nabapally, Barasat, North 24 Parganas, Kolkata 700126, West Bengal, India*

[2]*Satyabharati Vidyapith, Nabapally, Barasat, North 24 Parganas, Kolkata 700126, West Bengal, India*

umsbv@yahoo.in

[3] *Department of Physics, Government College of Engineering & Ceramic Technology, Kolkata 700010, West Bengal, India*

saibal@iucaa.ernet.in

Abstract: *In the present Note we have presented some documents to reveal the longstanding relationship of Indian amateur astronomer R. G. Chandra with British Astronomical Association.*

1 Introduction

Radha Gobinda Chandra (1878 - 1975), an Indian amateur astronomer, had a British connection not only in the sense that he was then under the British Rule but also through his mentor Kalinath Mukherjee, a law practitioner in the District Court of Jessore, Bengal. While Mukherjee was a college student, he had the opportunity to come in close contact with Sir M. J. Herschel, M. A. and Bar-at-Law who was the then District and Session Judge of Nadia district of undivided Bengal. He was the son of Sir John Herschel (1792 - 1871) and the grandson of Sir William Herschel (1738 - 1822) who were the two pioneer astronomers[1].

However, in the present note we would like to investigate Chandra's direct British connection through his scientific works, especially with the British Astronomical Association (BAA), who elected Chandra as their honorary member for his important contributions in observational astronomy.

2 Observation Of Comets

2.1 7P/Pons-Winnecke

The first British connection of Chandra can be traced back through the reporting "Search for meteors from the Pons-Winnecke Radiant", in the journal *Nature*[2] which goes as: *R. G. Chandra of Jessore, India, also reports a fruitless search for meteors in the night of June 25. He states that Prof. Ray of Bolpur saw two meteors radiating from the neighbourhood of θ Bootes.*[1]

Chandra was successful in observing the comet $7P/Pons-Winnecke$. It is known that on 20 June 1927, at about 15.5^h U. T. (21^h IST), Chandra was busy with his usual scheduled programme for observations of variable stars. He suddenly noticed a nebula-like object just North-West of the bright star Vega (α Lyrae). At that time the celestial body was visible on the line joining star γ Draconis and α Lyrae and was nearer (RA: $18^h\ 22^m\ 30^s$, Dec: $+40^0\ 30'$) to the latter one. After consulting the handbook of BAA, he came to know that the object under his observation was the comet $7P/Pons-Winnecke$. During the period of his observation, Chandra observed the comet to pass through the constellations Lyra, Cygnus, Vulpecula, Delphinus, Pegasus, Acquarius, Sculptor and Phoenix at a very fast speed of $40,000$ km/hr.

2.2 2P/Encke

Following the instruction of A. C. D. Cromlin, the Director of BAA, Chandra[3] also observed the comet $2P/Encke$ 1927 having shortest period of 3.30 years among the periodic comets. He searched out this comet in 1928 at 7 PM from Jessore with his 3-inch telescope in the Pegasus. This comet which appeared to him as a small nebulosity near the Andromeda galaxy (M31) remained visible from 19 October 1927 to 3 April 1928 during the apparition.

2.3 C/1942 X1 Whipple-Fedtke-Tevzadze

On 24 February 1943, at about 16.5 U. T. (22.00 IST) Chandra[3] noticed a nebula-like object near the star γ Ursae Majoris. Later he could recognize the object as a comet though could not identify it. He made series of observations on the comet until 10 May 1943 with the help of two refracting telescopes, one of his own 3-inch and the other 6.25-inch lent to

[1]Here, Prof. Ray means Jagadananda Roy (1869 - 1933) of Santiniketan who was a renowned science teacher of the school at Santiniketan under Viswabharati University, Bolpur founded by the Nobel Laureate poet Rabindranath Tagore (1861 - 1941).

him by the American Association of Variable Star Observers (AAVSO). Chandra recorded (i) the apparent path and cometary phenomena of the comet, and (ii) the abrupt variations in its brightness. Later on, he came to know from the Journal of BAA that the long period comet $C/1942\ X1\ Whipple-Fedtke-Tevzadze$ was really a variable one and the phenomena of variations in magnitude was due to influence of solar magnetic disturbances during a sunspot maximum.

3 Variable Star Observer

As an honorary member of BAA and AAVSO, Chandra's responsibility was to contribute his collected observational data on the period and magnitude of the variable stars. Since 1919, his observational data were regularly published in the Monthly Report of AAVSO[4], Memoirs of the BAA[5] and elsewhere. In this way he made a good relationship with different scientific personalities, like Felix de Roy, Director, Variable Star Section, BAA who in a letter (dated 27 December 1923) expressed his desire to meet Chandra, by writing: *"I seize this opportunity in saying that your excellent observations and remarks are always much valued by this section. ... I should be personally pleased to meet you if ever you were to cross to Europe."*[6]

Probably in this same spirit Leon Campbell, Recording Secretary of AAVSO has remarked in his article 'The Role of the Amateurs in Variable Star Astronomy' that *"In foreign countries we have Radha G. Chandra, official of Bagchar, India. Mr. Chandra, now in his sixtieth year, who has been aiding in the variable star work since 1919, has accumulated probably more observations on variable stars than any other AAVSO foreign observer, well over 50,000."*[6]

So it is really understandable that how difficult is it to collect and represent the huge number of observations made by Chandra throughout his life. Actually, in the year ending in October 1926 he made no fewer than 1685 observations, of which he made 226 observations in the month of March only[7]. Chandra reported 34 individual variable stars to the BAA[8] on which he made observations during the period 1920-24 (Table-1).

4 Observation Of Lunar Eclipse

Chandra observed the occultation and lunar eclipse of 20 February 1924 which he reported to BAA[9] as follows: *"Arrangements were made with two friends to observe the Lunar eclipse*

Table 1: Observations made by Chandra on 34 variable stars (1920 - 1924)

VARIABLE OBSERVED	NO.	VARIABLE OBSERVED	NO.
R Andromaedae	21	V Cygni	14
W Andromedae	55	R Draconis	16
R Aquilae	7	T Draconis	3
R Arietis	42	R Geminorum	33
R Aurigae	25	S Herculis	3
X Aurigae	50	T Herculis	34
R Bootis	65	U Herculis	45
S Bootis	53	R Hydrae	101
V Bootis	57	R Leonis	33
R Camelopardalis	21	U Orionis	48
X Camelopardalis	29	R Pegasi	7
T Cassiopeiae	39	R Serpentis	10
T Cephei	17	V Tauri	18
s (Mira) Ceti	136	R Ursae Majoris	30
S Coronae	62	S Ursae Majoris	69
X Cygni	86	T Ursae Majoris	48
R Cygni	19	S Virginis	52

and occultations of stars, one to watch the minute hand, the other to watch the second hand, and both counting the minutes and seconds independently and record the time when I shouted 'one', 'two' and 'three' from the telescope. This was carefully done so that we get a very accurate time. Time was taken from the Jessore Telegraph Office at 4 p.m. at which hour each day the time is signaled from the Government Telegraph Office at Calcutta. The sky was very fine and seeing very good: the observations were made with naked eye, with binoculars and with a 3-inch refractor using powers of 32 and 80."

The observational report of the Lunar eclipse of 26 September 1931 was published in the Vol. 42 of *The Journal of the British Astronomical Association*[10] and observation of Annular Solar Eclipse of 21 August 1933 was also reported in the same journal[11] in the Vol. 44. BAA published the report of the Annular Solar Eclipse in the following form :

Observations of Annular Eclipse of the Sun at Jessore (India), 1933, August 21
Latitude 23 *deg.* 10 *min.* 5 *sec., Longitude* 89 *deg.* 15 *min.* 15 *sec.*
First Contact - $3^h40^m15^s$ *GMT.*
Second Contact (Formation of Annulus) - $5^h19^m59.2^s$ *GMT.*
Last contact not observable owing to clouds.
Instrument : 3*-inch refractor*
An attempt was made to see the corona by putting the Sun out of the field of view, but without success.

A short communication by Chandra on 'Rahu' was published in the above mentioned journal[12] in a different issue. The communication is reproduced below :

Rahu - There have been several communications to the Association [JBAA 43, 317 (1933); JBAA 45, 322 (1935)] regarding 'Rahu', but so far there has been no correct explanation. Hindoo astronomy may be divided into two sections, mythological and mathematical. In the Indian Epics there are many narratives and fables relating to celestial bodies, and these may be taken to constitute the first of these sections. As well as Rahu there is another term Ketu, and there are with these, planets called 'Nabagraham', viz., Rabi, the Sun; Shome, the Moon; Kuja, the Mars; Buddha, Mercury; Guru, Jupiter; Shitau, Venus; Manda, Saturn, Rahu being the ascending node and Ketu the descending node. These are regarded as powerful deities having influence on the affairs of humnity, and they are also used in Indian astrology.

In the Sreemat Bhagabat Puran, Part 8, Chapter 9, Shloks 21-23, it is narrated that Rahu was a Danab (demon), the son of Shinghika, the wife of Biprachitti. The Danabs were the

antiparty of the Devs, having no right to drink the 'Amrita', a divine liquor which made the Devs immortal. Rahu made an attempt in disguise to drink the Amrita along with the Devs, but this was pointed out by Surja (the Sun) and Chandra (the Moon). On this, Hari, the Prince of the Devs, cut off the head of Danab Rahu, but as a small quantity of the Amrita entered the throat his head became immortal and was placed in the sky as a 'Graha'. The Sun and Moon having betrayed his attempt to drink the Amrita, Rahu developed a hatred for them, which has resulted in his endeavouring to devour them whenever he gets an opportunity; this he cannot do because he has only a head and no body.

Thus is the story, from the epic, of Rahu and the cause of eclipses; but Indian astronomers have known the real causes from time immemorial.

As Rahu's body was not immortal it was thrown away, but at a later date Indian astronomers and astrologers placed the body, as Ketu, 180^0 *from Rahu in the Zodiac.*

In Hindoo mathematical astronomy Rahu and Ketu, the ascending and descending nodes of the planet's orbits, resemble the Greek Dragon's Head and tail, and are the two points where eclipses ocur, being referred to as Patha in the Surja Siddhanta. - R. G. Chandra.

5 Conclusion

Besides Felix de Roy we would like to mention here some other astronomers of BAA with whom a cordial relationship were built by Chandra. Here is a part of a letter (dated 28 August 1928), written by A. N. Brown of BAA to be quoted:

"I acknowledge with thanks the report of 15 complete sheets of your observation of variables made this year ... I have so far only just glanced over your sheets, but this glance is sufficient to show that you have again done valuable work, particularly, perhaps, in the regularity of your observations of some of the Irregular U Germinorum etc. in spite of the unfavourable weather with which you say you have had ..."

From another letter by Y. M. Holborn, the then secretary of BAA, we come to know how indispensable were, for the professionals, the data collected by Chandra from the observation of variable stars.

Due to his very old age when Chandra tendered his resignation from the membership of BAA, then Holborn reacted as follows (letter dated 30 January 1941):

"I am passing on your letter of resignation to Mr. Brown who deals with these things. But I must say, I think it is a great pity to resign at this time when the Association is in the utmost

need of support.

Your longstanding work for the variable star section too will be greatly missed just at the time when Lindley and others like myself with full time war duties have had to give up observing.

I beg to you as an old member to reconsider this decision of yours."

However, no concrete official document is available to us to ascertain whether Chandra ultimately withdrew his resignation or not. We guess he did not as very sincere Chandra thought that without contributing any astronomical data to BAA he should not be an ornamental member. Not only that, when old age forced Chandra to withdraw himself from active astronomoical activities, he donated all his books and periodicals (sent to him by BAA, AAVSO and other organizations) as well as his legendary 3-inch telescope to Barasat Satyabharati Vidyapith, a Higher Secondary School close to his residence, for the use of future generations. Finally, it may be mentioned that some volumes of those Journals are still there in the school library of that institution which is, incidentally, the past and present working places of the first and second author respectively.

REFERENCES

1. S. N. Biswas, U. Mukhopadhyay and S. Ray, arXiv:physics.hist-ph/0195697 (2011).
2. *Nature*, Vol. 107, No. 2700, p. 694 (1921).
3. Radhagobinda Chandra, *Dhumketu* (Puthipatra, Kolkata, 1985).
4. *Monthly Reports and Annual Reports of the American Association of Variable Star Observers*, p. 133 (1926).
5. *Memoirs of the British Astronomical Association*, vol. XXVIII, Table C. (1929).
6. Ranatosh Chakrabarty, *Jyotirbijnani Radhagobinda* (Puthipatra, Kolkata, 1999).
7. Rajesh Kochhar and Jayant Narlikar, *Astronomy in India: Past, Present and Future* (IUCAA, Pune and IIA, Bangalore, 1993).

8. Otto Struve and Velta Zebres, *Astronomy in the 20th Century* (Macmillan Co., New York, p. 354, 1962).

9. *Journal of the British Astronomical Association* 34, 241 (1924).

10. Ibid, 42, 178 (1931).

11. Ibid, 44, 157 (1934).

12. Ibid, 45, 407 (1935).